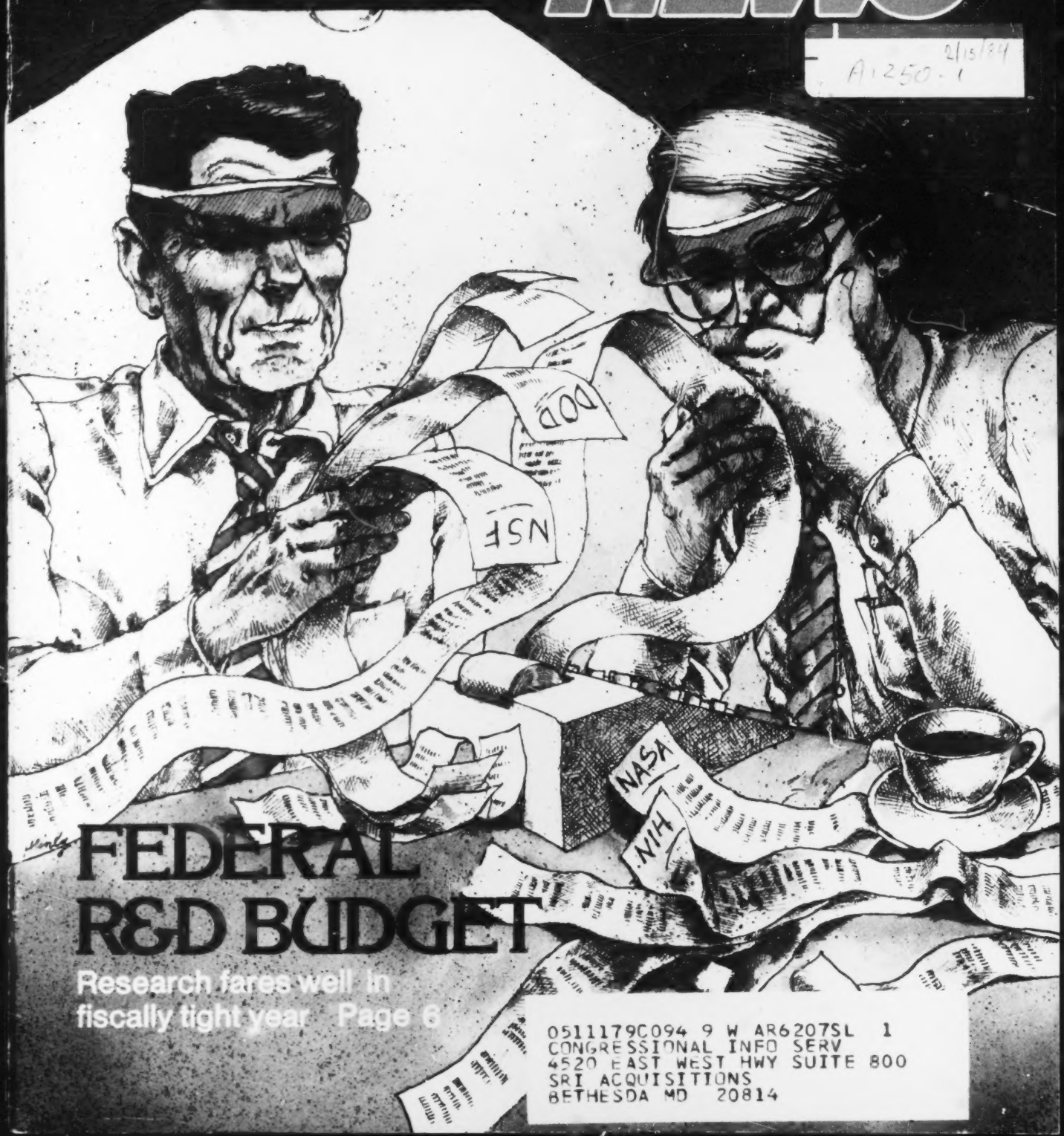
FEBRUARY 13, 1984

CHEMICAL & ENGINEERING

NEWS

2/15/84
A1250-1



FEDERAL R&D BUDGET

Research fares well in fiscally tight year Page 6

0511179C094 9 W AR6207SL 1
CONGRESSIONAL INFO SERV
4520 EAST WEST HWY SUITE 800
SRI ACQUISITIONS
BETHESDA MD 20814

CHEMICAL & ENGINEERING
NEWS
Volume 62, Number 7
CENEAR 62 (7) 1–48
ISSN 0009-2347
FEBRUARY 13, 1984

News of the Week

- **Cuts in natural gas prices needed to make Canadian petrochemicals competitive, task force says.** **Page 4**
- **OTA concludes outlook for nuclear power is dim.** **Page 5**
- **EPA suspends use of ethylene dibromide on grains.** **Page 5**
- **Three U.S. scientists win Wolf prize for their work in NMR spectroscopy.** **Page 5**

Business

Chemical firms repurchase their stock to cover employee option plans, retain dividends, support its market value. **Page 14**

International Business

West German chemical companies enjoyed higher sales and higher profits last year; prospects for 1984 are good. **Page 15**

Government

DOD Secretary sees ballistic missile defense as long-term goal, requests budget hike for basic research to attain it. **Page 19**

Science

Discovery of how living plants produce ethylene could lead to higher yields, more efficient harvesting; chemists commemorate Mendeleev's birthday; copper ions catalyze olefin epoxidation; Monsanto honors acetic acid process developers. **Page 21**

Education

Men still outnumber women on university chemistry faculties but number of all-male faculties has plummeted since 1970. **Page 26**

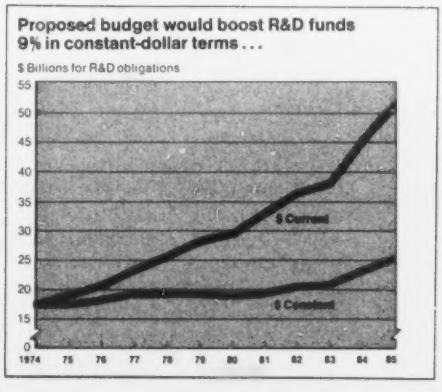
Books

"Project Evaluation in the Chemical Process Industries" is a text for the student, not for the business executive. **Page 27**

Letters 2
Editor's Page 3

Concentrates
Business 12
Government 17
Science/Technology 20

The Departments
ACS News 29
People 31
Newscripts 48



News Focus

President's proposed 1985 budget raises R&D funds 14%; defense gets 96% of increase. **Page 6**

R&D Funding Will Rise 14% In 1985 Federal Budget

Defense accounts for nearly 96% of $6.5 billion hike in R&D obligations; R&D funding requests for most of the departments and agencies are up

Janice R. Long, Lois R. Ember, and David J. Hanson
C&EN Washington

In his annual budget message to Congress, President Reagan characterized basic research as "a critical investment in the nation's future." Basic research, he said, "lays the foundation for a strong defense in the years to come and for new technologies and industries that will maintain U.S. industrial leadership, create new jobs, and improve our quality of life."

The fiscal 1985 budget proposal that accompanied that message bears out his words. Total obligations—money committed—for basic research are scheduled to rise 10% from 1984 to $7.9 billion. Outlays—money actually spent—will increase 11% to $7.5 billion. If these proposals are accepted by Congress, the two-year (1983-85) growth in federally supported basic research will total 24%.

Obligations for total R&D are up even more in the proposed budget, rising 14% from 1984 to $51.8 billion, resulting in a two-year increase of 35%. Outlays also are slated to be up 14% to $48.7 billion, a two-year increase of 33%. That's not bad in the context of a total federal budget in which outlays, at $940.3 billion, are only 8% more than in 1984 and 16% more than in 1983. (Revenues are estimated to be $745.1 billion, leaving a deficit of $195.2 billion.)

In general, proposed funding for R&D activities in fiscal 1985 continues the trend of recent years, with defense projects eating up nearly 96% of the $6.5 billion increase in federal R&D obligations. But for five of the 13 major federal departments and agencies that support R&D activities, funding requests are down from 1984, according to figures from the Office of Management & Budget.

With this emphasis on defense, it's not surprising that the Department of Defense remains the giant among the R&D-supporting agencies. With its 1985 total research, development, testing, and evaluation budget slated for $34.0 billion, including R&D facilities,

Glossary of budget terms

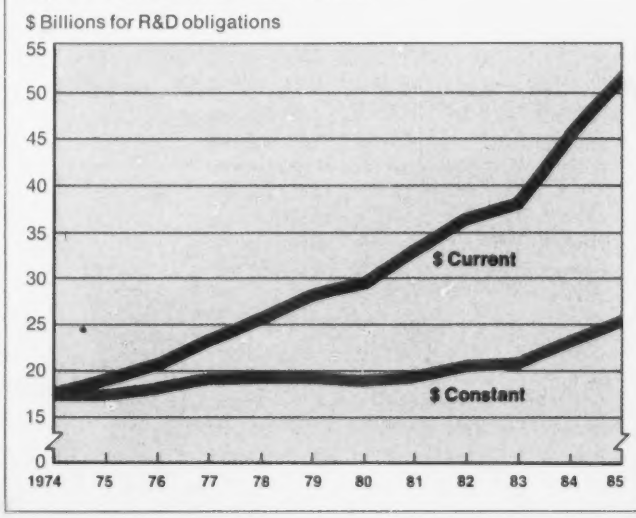
Fiscal year. Year running from Oct. 1 to Sept. 30. The fiscal year is designated by the calendar year in which it ends.

Obligations. Commitments made by federal agencies to pay out money for products, services, or other purposes, as distinct from the actual payments.

Outlays. Payments for obligations incurred under budget authority, generally made by issuance of checks by the Treasury. Outlays during any fiscal year may be for obligations incurred in prior fiscal years or in the same fiscal year.

Note. The R&D numbers obtained from individual agencies frequently differ from those used by the Office of Management & Budget in preparing its analysis of total federal R&D funding.

Proposed budget would boost R&D funds 9% in constant-dollar terms . . .



the department will account for 65% of total federal R&D spending, about the same percentage as in 1984. The 1985 figure is 26% more than 1984 obligations and includes a 15% increase for basic research to $939 million.

Most of the Defense funds are scheduled for development and testing of large strategic and tactical weapons systems. The largest of these include work on the Trident II missile system, funded at almost $2.1 billion, up 38% from 1984; evaluation of the Peacekeeper (MX) missile at $1.7 billion, down 13%; and continuing development work on the B-1B bomber at $508 million, down about 31%.

There is some significant growth in the Defense Department's basic research, but almost all of it is for development of technologies for sensors, high-velocity missiles, and directed energy systems that will be needed for an antiballistic missile system. This so-called "Star Wars" technology has led to a 123% increase in research on advanced technology development, to $3.0 billion in the 1985 budget.

As was the case in approving the 1984 budget, the enormous Defense RDT&E budget proposed for 1985 probably will become a prime target for Congressional budget cutters. DOD had about $2 billion chopped from its 1984 budget request, and with so much concern in Congress about the rising defense budget, the record R&D figures proposed for 1985 will be tempting targets. The advanced technology budget request for 1984, for instance, was cut more than 50%, so it can be expected that the huge increase requested by the President once again will be cut significantly. The budgets for major weapons systems also likely will be cut, probably as much as a billion dollars each, but the basic technology research base will remain intact.

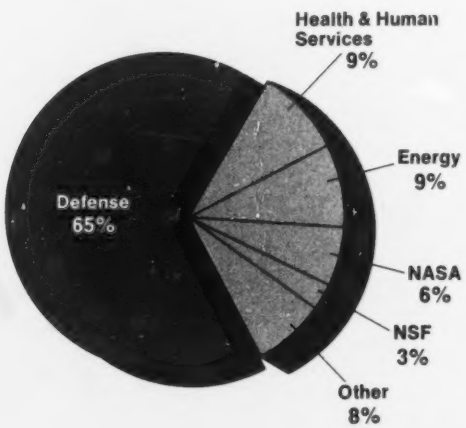
The Department of Health & Human Services again will be the second largest federal supplier of R&D funds, but its renewed eminence is not due to large Administration budget requests. The National Institutes of Health comprise more than 90% of the total R&D performed in HHS, a level that has been constant over the past several years. And, since the coming of the Reagan Administration, NIH budget increases have been very small. The $91 million increase requested in the 1985 NIH budget is just 2%, the third straight year of requested increases that are less than the rate of inflation. However, Congress, as the Administration well knows, has a habit of being quite generous where NIH is concerned.

None of the NIH institutes actually would receive a reduction in funds (there is a drop in construction of new facilities), but all are slated to grow such a small amount that NIH is going to have difficulty keeping its number of grants at the 1984 level. In her presentation of the department's budget, HHS Secretary Margaret M. Heckler said NIH would fund 17,000 research projects and awards in 1985, an increase of 5% over 1984. How that will be done on such a small increase is not detailed. Two areas of research singled out for special emphasis, however, are Alzheimer's disease and Acquired Immune Deficiency Syndrome.

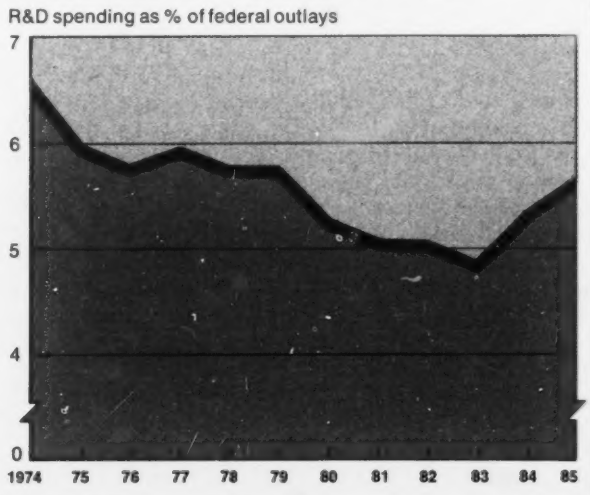
Other HHS agencies conducting research get similar small increases in the budget proposal. The Centers for Disease Control, which include the National Institute for Occupational Safety & Health, however, are slated for a small cut in occupation-related research. The Alcohol, Drug Abuse & Mental Health Administration is funded at $355 million, up $9 million from 1984. And the Food & Drug Administration's R&D on food and drug products would get a $2 million boost to $81 million. FDA, incidentally, has been without an administrator since September 1983.

The Department of Energy has slipped into third place as a supplier of R&D funds for 1985, but there seems to have been a turnaround in attitude toward research. For 1985, instead of asking for substantially

... with the Department of Defense getting the largest share ...



... and total R&D funding accounting for more than 5% of federal outlays



less R&D funding, it is requesting an increase of 8% to $4.9 billion. Even when the 22% ($314 million) increase for weapons R&D and testing is excluded, there remains a $61.2 million, or 2%, increase for DOE's civilian R&D programs. When this is contrasted with the 1984 budget request, which asked for an 11% cut in civilian R&D, the change of heart is evident.

Part of this shift, too, owes to Congress' refusal to go along with the requested cuts. As Energy Secretary Donald P. Hodel puts it, "We have come a long way in our discussion with Congress over how to provide a balanced and mixed energy system. I think we're getting there [in terms of] the series of technologies we are pursuing from the R&D standpoint." As an example of this progress, he says that whereas the department requested $70 million for conservation R&D in 1984, it is now requesting $148 million for 1985, only $3 million less than Congress actually appropriated for 1984.

Other DOE programs slated for declines are nuclear fission R&D, down 8% to $618.1 million (primarily because Congress axed the Clinch River breeder reactor); solar and other renewables, down 11% to $191.3 million; fossil energy R&D, down 17% to $272.9 million; and electric energy systems and storage, down 20% to $35.3 million. However, increases are scheduled for research on magnetic fusion, up 3% to $483.1 million; environmental research, up 4% to $228.2 million; and general science and research, up 16% to $746.1 million.

The big winner in DOE's budget request, aside from defense R&D, is supporting research and technical analyses, which is up 21% to $479.6 million. Within that category, support for basic energy sciences is up 24% to $419.5 million, with funding for chemical sciences up 9% to $89.7 million.

Overall, says Elliot Pierce, the chemical sciences division's director, chemistry didn't fare badly, considering the budget pressures. New facilities, such as the national synchrotron light source and the combustion research facility, will continue to be brought on stream and continuing emphasis will be placed on such research areas as photochemistry, coal chemistry, combustion, catalysis, and separation and chemical analyses. Operating expenses for materials science research are up 13% to $141.5 million. About half of the increase will go for actual research, the rest for major facilities operations.

At the National Aeronautics & Space Administration, a revival in activity is occurring, although not necessarily one accompanied by a revival of the large funding increases of the agency's heyday in the early 1960s. The total fiscal 1985 request for NASA is just under $7.5 billion, which NASA Administrator James M. Beggs says is about 4% higher than the current 1984 plan. As in the current fiscal year, large chunks of NASA's budget are being moved out of R&D and put into the general categories of program management and space flight operations and communications.

Still, even with most of its money diverted to ongoing projects related to the space shuttle, NASA lists a

THE TOTAL FEDERAL R&D BUDGET PROPOSAL

Total R&D funds would rise 14%

	Obligations			Outlays		
$ Millions	1985[a]	1984[a]	1983[b]	1985[a]	1984[a]	1983[b]
Defense	$33,852	$27,636	$22,925	$31,053	$25,310	$21,057
HHS	4,950	4,859	4,348	4,869	4,529	4,092
Energy	4,885	4,844	4,491	4,744	4,853	4,771
NASA	3,341	3,257	2,570	3,314	3,462	2,538
NSF	1,408	1,239	1,062	1,362	1,136	992
Agriculture	898	872	846	880	866	832
Transportation	498	519	360	481	445	280
Interior	363	415	374	368	403	403
EPA	281	250	241	277	252	312
Commerce	272	357	327	276	349	324
Agency for International Development	264	225	177	297	298	235
Veterans Administration	198	223	164	208	174	154
Nuclear Regulatory Commission	168	191	207	167	211	229
Other	396	393	338	416	399	340
TOTAL	$51,774	$45,280	$38,430	$48,712	$42,687	$36,559

a Estimate. b Actual. **Source:** Office of Management & Budget

Funds for basic research would rise 10%

	Obligations			Outlays		
$ Millions	1985[a]	1984[a]	1983[b]	1985[a]	1984[a]	1983[b]
HHS	$2914	$2783	$2473	$2800	$2591	$2319
NSF	1330	1173	1000	1288	1072	932
Energy	1230	1039	912	1134	1010	904
Defense	939	815	784	875	787	722
NASA	828	714	615	786	638	594
Agriculture	420	387	362	397	387	355
Interior	97	120	87	101	115	100
Smithsonian Institution	66	60	54	64	58	54
EPA	26	23	22	18	22	30
Commerce	18	21	19	19	19	19
Veterans Administration	15	15	14	15	15	14
Education	14	11	13	16	19	14
Other	29	31	28	35	37	28
TOTAL	$7926	$7192	$6383	$7548	$6770	$6085

a Estimate. b Actual. **Source:** Office of Management & Budget

Funds for R&D facilities would fall 9%

	Obligations			Outlays		
$ Millions	1985[a]	1984[a]	1983[b]	1985[a]	1984[a]	1983[b]
Energy	$ 661	$ 630	$ 576	$ 690	$ 606	$ 627
Defense	369	446	308	367	333	263
NASA	171	185	125	163	139	108
Agriculture	28	61	34	39	41	33
NSF	18	9	3	16	8	3
HHS	15	58	48	43	33	27
Other	45	49	43	49	37	27
TOTAL	$1307	$1438	$1137	$1367	$1197	$1088

a Estimate. b Actual. **Source:** Office of Management & Budget

1985 R&D budget of $2.4 billion, and an additional $939 million for R&D management. The biggest news in the budget is the $150 million that will go to starting design of a permanently manned space station. NASA predicts the effort will require $8 billion to complete by sometime in the early 1990s. The space station is expected to expand the commercial uses of space, and NASA is inviting other nations and private companies to finance such ventures for the future.

Continuing major R&D programs include work on the space telescope and development of an upper atmosphere research satellite. Large increases are slated for space shuttle payload development, up 30% to $105.4 million. The development of the gamma ray observatory is taking off as well, with a healthy 39% boost to $120.2 million. And the Venus radar mapper mission is almost out of sight with a proposed rise of more than 200% to $92.5 million.

A few new, small R&D projects also are funded in the 1985 budget. These include $1 million for interdisciplinary research, $3 million for tethered satellite payloads, $15 million for work on a scatterometer (to measure wind patterns across the oceans), and $16 million for startup work on the Mars geoscience/climatology orbiter.

The Administration's emphasis on basic research can easily be discerned in the National Science Foundation's total budget, which projects a 14% increase to $1.5 billion, including a 15% increase in research activities to $1.3 billion. The budgets for all but one of NSF's activities would be up; science and engineering education's budget is being held essentially constant at $75.7 million.

According to NSF director Edward A. Knapp, the agency has enough money to get its new science education initiative started, and it now needs to see what kind of proposals it will be getting in this area and how ongoing pilot programs work out.

Research instrumentation continues to be emphasized in the new budget request, with a 20.3% increase from 1984 to $237 million. About $122 million would support instrumentation for individual research projects, with the remainder going to support intrumentation at multiuser centers at universities and national centers. Support for research equipment and instrumentation by the directorate of mathematical and physical sciences is up 20% in the new budget to $99 million.

Student support is also a key point in the 1985 budget. The stipend for NSF graduate fellows will be raised from $8100 to $9000 per year, and the number of fellows will increase by 550 to 1550. The number of graduate students supported by research projects is expected to grow 1050, or 10%, to 11,614; total dollar support will increase 15% to $103.4 million. Support by the mathematical and physical sciences directorate is slated to rise 17% to $42.1 million, with the number of students up 496 to 4985. Support for postdoctoral research will increase 12% to $57.7 million. Support for research at predominately undergraduate institutions will increase 15% to $42.4 million.

One new initiative in the budget, supported at $10 million, is establishment of centers for cross-disciplinary research in engineering to do work in areas such as computer-integrated manufacturing systems, voice and data communication systems, and biotechnology processing systems. Another new, $500,000 initiative is research opportunities for women, which is aimed at allowing not only women wanting to re-enter the research area but those who have not yet had an opportunity to be principal investigators, to do independent research.

Research funding at the Department of Agriculture has been increasing slowly in recent years but has not been able to keep up with inflation. The 1985 budget request is just over 2% higher than the 1984 funding level, and, although some programs are up, much of the increase is wiped out by a 6% cut in research for the Forest Service.

The major research office at USDA is the Agricultural Research Service, which is the in-house research agency. With a requested 1.7% increase over the current fiscal year, significant research support will be provided for improving animal and plant genetics to resist disease, the biological control of pests, and soil fertility. Nearly $90 million has been requested for processing and storage research, some of which is likely to go to finding alternatives for fumigating stored food after the currently used pesticide, ethylene dibromide, has been banned.

The Cooperative State Research Service is slated for a 7.7% increase over current-year levels, with much of the rise slated for competitive research grants in animal science and biotechnology. This $33 million increase counters cuts of $11 million in special research grants and $5.8 million in livestock and poultry disease research. There is also another $3.5 million added to support research at the state agricultural experiment stations, the 1890 colleges, and Tuskegee Institute.

The Forest Service, the other major USDA research agency, is concerned primarily with timber sales and reforestation. Its research function is cut to $103 million in 1985. This cut of more than $6 million from 1984 would mean several labs would have to be closed and many low-priority research projects discontinued. USDA estimates that more than 100 positions would be eliminated.

The Department of Interior's R&D request for 1985 is estimated at $363 million, down $52 million from the current fiscal year. Budget documents say the decrease "reflects reductions in activities more appropriately supported by the private sector or states."

Nearly 90% of Interior's research budget is consumed by the Geological Survey, $148 million; the Fish & Wildlife Service, $111 million; and the Bureau of Mines, $69 million. Only the Fish & Wildlife Service's R&D efforts would get increased support in 1985, and the $5 million boost is slated for state fish and wildlife agencies and for acid rain research, which will be supported at a level of about $21 million.

Among the research efforts still retained by Interior are studies to improve the scientific basis for evaluating water resources, including the effects of underground waste storage (Geological Survey); to develop

HOW THE AGENCIES FARE

Research at NASA to increase 14%

$ Millions	1985[a]	1984[a]	1983[b]
Conduct of R&D	**$2390.6**	**$2019.2**	**$1955.5**
Physics and astronomy	677.2	567.6	470.3
Space transportation systems	361.4	431.7	415.5
Space applications	344.1	291.0	347.7
Aeronautical research	342.4	302.3	280.0
Planetary exploration	286.9	217.4	186.4
Space station	150.0	—	—
Space research & technology	150.0	137.0	124.6
Life sciences	63.3	58.0	55.7
Tracking and data acquisition	15.3	14.2	13.4
Research program management	**939.0**	**861.0**	**759.0**
R&D facilities	**171.0**	**185.0**	**125.0**
TOTAL	**$3500.6**	**$3065.2**	**$2839.5**

a Estimate. b Actual. **Note:** Obligations. **Sources:** National Aeronautics & Space Administration, Office of Management & Budget

EPA's R&D effort on the rise again

$ Millions	1985[a]	1984[a]	1983[b]
Air	$ 65.2	$ 62.3	$ 60.0
Energy	48.5	30.4	26.7
Hazardous waste	34.8	32.3	33.4
Toxic substances	27.1	24.4	26.8
Water quality	26.8	24.8	31.6
Drinking water	23.1	23.8	21.8
Interdisciplinary	20.4	21.3	9.8
Superfund	12.7	8.8	6.9
Program management	9.3	8.5	8.9
Pesticides	8.0	6.3	6.1
Radiation	2.1	1.8	1.5
TOTAL	**$278.0**	**$244.7**	**$233.5**

a Estimate. b Actual. **Note:** Obligations. **Source:** Environmental Protection Agency

USDA research would be up, but barely

$ Millions	1985[a]	1984[a]	1983[b]
Agricultural Research Service	$485.0	$476.7	$463.0
Cooperative State Research Service	266.8	247.7	244.9
Forest Service research	103.1	109.4	107.7
National Agricultural Library	11.7	10.4	9.1
TOTAL	**$866.6**	**$844.2**	**$824.7**

a Estimates. b Actual. **Note:** Obligations. **Source:** Department of Agriculture

DOD to receive giant increase

$ Millions	1985[a]	1984[a]	1983[b]
Tactical programs	$10,510	$ 7,909	$ 7,255
Strategic programs	8,714	7,843	5,825
Intelligence & communications	4,216	3,404	2,708
Defensewide mission support	3,877	3,284	2,975
Advanced technology development	3,442	1,386	823
Technology base	3,226	3,042	3,238
TOTAL	**$33,985**	**$26,868**	**$22,824**

a Estimates. b Actual. **Note:** Obligations. **Source:** Office of Management & Budget

Research at DOE would rise 8%

$ Millions	1985[a]	1984[a]	1983[a]
Energy supply R&D	**$2035.6**	**$2019.5**	**$2125.9**
Nuclear fission	618.1	674.7	814.0
Magnetic fusion	483.1	470.8	458.1
Supporting research and technical analysis	479.6	395.1	333.0
Environmental research	228.2	219.3	217.0
All other	226.6	259.6	303.8
Defense R&D, testing	**1723.2**	**1409.3**	**1184.8**
General science and research	**746.1**	**641.3**	**569.0**
Fossil R&D	**272.9**	**329.6**	**311.0**
Conservation R&D	**148.0**	**150.9**	**135.0**
TOTAL	**$4925.8**	**$4550.6**	**$4325.7**

a Estimate. **Note:** Obligations. **Source:** Department of Energy

NIH R&D request is essentially static

$ Millions	1985[a]	1984[a]	1983[b]
National Institutes	**$4219.6**	**$4120.8**	**$3705.8**
Cancer	1101.1	1077.3	987.6
Heart, Lung & Blood	718.9	703.2	624.3
Arthritis, Diabetes & Digestive & Kidney Disease	475.3	462.6	413.5
General Medical Sciences	423.9	415.6	369.8
Neurological & Communicative Disorders & Stroke	344.6	335.2	297.1
Allergy & Infectious Diseases	325.4	314.1	279.1
Child Health & Human Development	280.2	275.2	254.3
Environmental Health Sciences	183.8	179.8	164.9
Eye	157.9	154.7	141.9
Aging	117.4	114.9	94.0
Dental Research	91.1	88.2	79.3
Research resources	**245.7**	**242.6**	**213.9**
National Library of Medicine	**51.3**	**49.6**	**51.9**
Office of the Director	**27.5**	**26.7**	**24.7**
John E. Fogarty Center	**11.4**	**11.3**	**10.1**
Research facilities	**11.1**	**25.0**	**17.5**
TOTAL	**$4566.6**	**$4476.0**	**$4023.5**

a Estimates. b Actual. **Note:** Obligations. **Source:** Office of Management & Budget

NSF budget would be up 14% . . .

$ Millions	1985[a]	1984[a]	1983[b]
Mathematical and physical sciences	$ 416.7	$ 358.8	$ 300.4
Astronomical, atmospheric, Earth, and ocean sciences	373.5	330.0	280.8
Biological, behavioral, and social sciences	253.1	224.6	191.2
Engineering	147.1	120.7	101.1
Antarctic program	115.1	102.5	83.2
Science and engineering education	75.7	75.0	16.1
Program development and management	70.9	66.6	65.7
Scientific, technological, and international affairs	46.9	40.8	44.1
Special foreign currency	2.8	2.9	2.2
TOTAL	**$1501.8**	**$1321.9**	**$1084.8**

a Estimate. b Actual. **Note:** Obligations. **Source:** National Science Foundation

. . . with funding for sciences up 11% . . .

$ Millions	1985[a]	1984[a]	1983[b]	% change 1984–85
Ocean sciences	$ 124.9	$113.7	$102.5	10%
Physics	121.8	105.9	89.2	15
Physiology, cellular and molecular biology	116.4	102.1	87.3	14
Materials research	113.0	97.5	81.1	16
Atmospheric sciences	98.6	89.3	75.5	10
Astronomical sciences	93.4	78.2	62.7	19
Chemistry	92.1	80.0	67.6	15
Biotic systems and resources	59.9	53.4	46.0	12
Mathematical sciences	50.5	41.5	34.8	22
Earth sciences	48.6	41.5	34.9	17
Behavioral, neural sciences	42.2	38.5	34.0	10
Computer research	39.3	33.9	29.3	16
Chemical and process engineering	32.5	26.6	22.6	22
Social, economic sciences	28.0	24.6	20.3	14
TOTAL	**$1021.9**	**$922.7**	**$767.5**	**11%**

a Estimate. b Actual. **Note:** Obligations. **Source:** National Science Foundation

. . . and chemistry up 15%

$ Millions	1985[a]	1984[b]	1983[a]	% change 1984–85
Chemistry	$ 92.1	$ 80.0	$ 67.4	15%
Chemical dynamics	16.9	14.5	13.6	16
Structural chemistry and thermodynamics	15.5	13.6	12.9	14
Chemical physics	14.8	13.1	10.6	13
Chemical instrumentation	13.5	11.6	7.8	16
Synthetic organic, natural products chemistry	11.3	9.7	8.3	18
Chemical analysis	11.0	9.6	7.1	15
Synthetic inorganic, organometallic chemistry	9.1	7.9	7.1	15
Chemical and process engineering	**32.4**	**26.6**	**22.4**	**22**
Chemical, biochemical processes	7.2	5.7	4.5	26
Kinetics, catalysis, and reaction engineering	5.6	4.5	3.5	24
Thermodynamics and transport phenomena	4.9	4.1	3.9	19
Particulate, multiphase processes	4.5	3.9	3.2	15
Engineering energetics	4.2	3.8	3.5	10
Separation processes	3.4	2.2	1.7	54
Minerals, primary materials processing	2.6	2.4	2.1	8
Biochemistry	**14.6**	**12.8**	**11.4**	**14**
Marine chemistry	**13.4**	**12.0**	**10.8**	**12**
Solid-state chemistry	**9.0**	**7.7**	**6.5**	**17**
Polymers	**7.6**	**6.4**	**5.5**	**19**
Atmospheric chemistry	**7.2**	**6.7**	**5.6**	**7**
Experimental, theoretical geochemistry	**6.1**	**5.7**	**4.9**	**7**
Volcanology and mantle geochemistry	**3.9**	**3.6**	**2.6**	**8**
TOTAL	**$186.3**	**$161.5**	**$137.1**	**15%**

a Estimate. b Actual. **Note:** Obligations. **Source:** National Science Foundation

domestic sources for strategic and critical minerals now being imported (Bureau of Mines); and to develop cloud seeding techniques to generate additional water supplies (other department programs).

The Department of Commerce's research efforts also would be cut back an estimated $85 million to $272 million. Research support by the National Oceanic & Atmospheric Administration is slated to be cut 31% to $167 million. Termination is scheduled for the undersea research program and the Sea Grant program, and substantial decreases are in store for ocean mineral activities and ocean and Great Lakes research and services.

Compared to NOAA research, the National Bureau of Standards must be quite happy with what it says is a 9% increase to $126.1 million. Funding for measurement research and standards will be up 14% to $58.8 million, and funding for the technical competence fund up 6% to $8.7 million. However, the Administration wants to cut the funding for computer sciences and technology in half and completely do away with the fire research program—moves it tried to make for 1984 only to be beaten back by Congress.

After three years of rather drastic cuts to the Environmental Protection Agency's research budget—cuts that Congress repeatedly has attempted to restore—the Reagan Administration has reversed itself. For 1985, the Administration has requested a 14% increase in R&D funds to $278 million, but that is still $25 million less than the amount spent in fiscal 1981.

EPA Administrator William D. Ruckelshaus says the agency's research program will be strengthened in four major areas: acid rain, risk assessment, control technology, and human health hazards. With a 124% boost to the acid rain/energy research ledger, mainly to study causes, effects, and mitigation strategies, this endeavor garners the greatest share of the scheduled 14% overall increase. But also receiving significant funding is research to understand and control hazardous and toxic chemicals in air, water, and land.

The Administration also is requesting an increase of $4.4 million to improve its risk assessment ability. Special emphasis will be placed on estimating the effects of pollutants on human health. EPA's new integrated cancer assessment program will generate data to relate air pollution to cancer, for instance.

Though the growth in environmental R&D funds is welcomed after three years of strangulation budgets, the hefty increase slated for acid rain research is viewed with mixed feelings. Environmental groups, several members of Congress, and Canadians all recognize the need for more study to fill in knowledge gaps, and they applaud the additional funds. But they also view the increase as a sop that allows the Administration to wiggle off the hook of controversial acid rain control programs.

Congress still has to work its will on the fiscal 1985 budget. Changes will be made. But except in the area of defense R&D, any changes in funding are likely to be upward rather than downward. At least that has been the practice in recent years, and it is unlikely to change in an election year. □

Chemical Firms Lured by Their Own Stock

"The company believes that the acquisition of [its] shares at this time is an attractive investment." This is part of a news release late last year announcing that National Distillers' board of directors had authorized the repurchase of up to 3 million of its own shares in the open market or through private transactions.

In the past six months, a number of chemical producers have chosen to repurchase their own stock. Reasons vary from company to company, but generally fall into a well-defined pattern for industry as a whole.

In general, companies repurchase shares to cover employee stock purchase and bonus plans rather than increasing the number of shares outstanding by creating new shares. Issuing new shares would dilute earnings per share and lower the book value of the company. In fact, the very act of repurchasing can raise earnings per share, and at times companies will repurchase stock just for this purpose. Covering of stock plans is the principal reason for the majority of repurchasing schemes, according to a study last year by the Conference Board, a business research group in New York City.

Other companies, such as National Distillers, will invest cash in their own securities. This is especially true of companies with temporary cash surpluses. By buying their own shares, dividends go to the corporate treasury, and, in effect, the company is retaining the dividend on that stock. Another way of looking at it is that the company is earning a cash return on its investment equal to the dividend rate paid on the stock outstanding. In addition, it would gain any increase in the stock price in a rising stock market.

Also, another group of chemical companies that have repurchased stock in the past six months are trying to get rid of high-overhead odd-lot (small-lot) holdings by shareholders. When the stock is held in small quantities by a large number of stockholders, the cost of servicing those accounts is a very heavy burden to corporations. Thus, at various times companies will buy back the odd lots from stockholders. Usually odd lots are defined as fewer than 100 shares.

Another strategy in firms' repurchasing shares is to support the market value of their stock. However, according to the Conference Board study, there is some doubt as to the ability of large corporations with large numbers of shares outstanding to buy back enough shares to make much of a difference in the stock price. Further, the study says, some executives believe that it would be illegal to engage in this practice.

Though stock repurchasing plans are expected to flourish, they by no means will be uniform in their pace. Like any prudent investor, companies tend to try to buy their stock when the market price is low. Thus some companies will allocate a certain amount of money for stock repurchases rather than announce the number of shares they will buy. A prime example of this is Sun Co., which announced earlier this year a $100 million stock repurchase program to take place throughout 1984. However, Sun has not said how many shares it will try to acquire. At current market prices, this would represent almost 2 million shares. However, if prices come down, look for Sun to start buying more heavily.

William Storck, New York

Size of and reasons for repurchase vary widely

Company	Number of shares	Value[a]	Remarks
Allied	5 million	$275 million	Also repurchased 2.9 million of 3 million previously authorized shares
Ashland Oil	35,000	$35 million[b]	Private transaction
Beatrice Foods	10 million	$340 million	Company also repurchased 105,531 odd-lot shares
Dow Chemical	2 million	$68 million	Purchased to cover shares issued to employees through stock option and purchase plans
Engelhard	150,000	$5.7 million	To provide shares for delivery under stock bonus and option plans. May repurchase 100,000 more
Gulf Oil	421,564	$18.5 million	Repurchased odd lots of 99 shares or fewer
Eli Lilly	3 million	$195 million	Repurchased for stock plans and corporate purposes
National Distillers	3 million	$81 million	Company called itself "an attractive investment"
Olin	600,000[c]	$18.4 million	Odd lots of 99 shares or fewer
Sun Co.	d	$100 million	Already has repurchased 11.5 million shares. Purchases will be used for strategic corporate purposes or held as treasury shares

a Approximate value at time of announcement. b Face value. c Approximate number of odd-lot shares outstanding. d Number of shares repurchased will depend on market price.

Chemistry Faculties Gain Women Slowly

Male dominance of Ph.D.-granting chemistry faculties in the U.S. is still almost absolute. But it is not quite so absolute as it was.

According to the latest in a series of six biennial surveys conducted for the American Chemical Society's Women Chemists Committee, such faculties were 95.9% male during the 1982–83 academic year. This was down from 98.5% recorded for the 1970–71 academic year in the first survey.

Over this 12-year span the total number of women on such staffs increased from 61, out of 4091, to 180, out of 4470. All the surveys include only full-time staff members holding the rank of assistant professor, associate professor, or professor. They exclude research associates and other staff members not in the tenure track.

Although the total number of women still remains remarkably modest, there has been a sharp decrease in the number of all-male faculties—from 74% of the total in 1970–71 to 44% in 1982–83. Over the same period the number of faculties with three or more women has grown from four to 14. The number with just one woman has moved from 33 to 61.

A parallel analysis of the faculties of biochemistry departments offering graduate studies indicates that women have a somewhat stonger foothold on such staffs. But it also reveals that this foothold has not grown lately. It actually slipped slightly from 8.6% in 1976–77 to 8.5% in 1982–83. In 1982–83, 23% of the 136 departments surveyed had no women on their faculties.

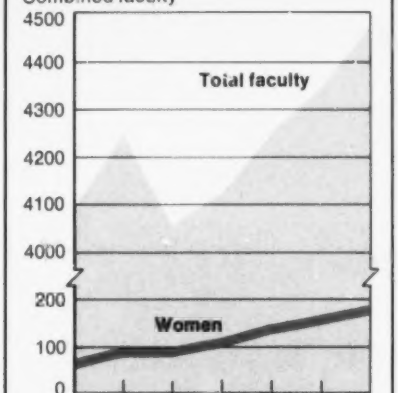
This latest survey was compiled by Sister Agnes Ann Green, former professor of chemistry at Immaculate Heart College, Los Angeles, using data from 1983 College Chemistry Faculties published by ACS. She also conducted the five previous surveys. For these she used the ACS Directory of Graduate Research.

Green's data seem to indicate that women still are not joining chemistry faculties in numbers proportional to the rate at which they are earning chemistry Ph.Ds. If a 4% attrition rate is assumed for faculty members, it appears that in recent years about 7% of those joining the ranks of chemical academia have been women. In these same years women have made up about 14% of chemistry Ph.D. graduating classes.

The faculty of American University, Washington, D.C., had the highest proportion of women in 1982–83—four out of 10. The faculty with the highest number of women, eight out of 27, was that of the colleges associated with the University of Massachusetts. This faculty also shows the largest gain for women over the 12 years covered by the surveys—from one to eight. The University of Illinois, Chicago, went from one to six over this period, with all of the gain actually coming between 1980–81 and 1982–83. And two schools show gains of four women since 1970–71—the University of Lowell and the University of California, San Diego. They both went from zero to four.

Ohio State University had the largest remaining all-male chemistry faculty, 37, in 1982–83. It was followed closely by the University of Washington, 35, and Iowa State University, 33. The largest all-male biochemistry department, 22, was at the University of Texas, Galveston. □

Women make up only 4% of chemistry faculties



a Of all Ph.D.-granting chemistry departments. **Source:** Report compiled for ACS Women Chemists Committee

These faculties have at least three women . . .

School[a]	Faculty[b] Total	Women
U of Massachusetts, Amherst and Boston	35	3
U of Massachusetts, associated colleges	27	8
U of Illinois, Chicago	36	6
Rutgers U	41	6
U of Puerto Rico	31	5
American U	10	4
U of California, San Diego	41	4
City U of New York	84	4
U of Lowell	25	4
U of Maryland	46	4
Portland State U	22	4
Boston U	21	3
U of Idaho	14	3
Polytechnic Institute of New York	22	3

. . . but these larger faculties are still all male

School[a]	Total faculty[b]
Ohio State U	37
U of Washington	35
Iowa State U	33
State U of New York, Stony Brook	31
Oregon State U	30
U of Chicago	29
U of Cincinnati	29
Virginia Polytechnic Institute	29
Georgia Institute of Technology	28
Northwestern U	28
U of Pittsburgh	28
U of Utah	28
U of California, Santa Barbara	27
U of Oklahoma	27
U of Arkansas	26
Auburn U	25
Notre Dame U	25
U of Virginia	25

a Ph.D.-granting schools only. b 1982–83 academic year.